MENINGOCOCCAL DISEASE

DISEASE REPORTING

In Washington

DOH receives approximately 70 to 115 reports of meningococcal disease per year, for an average rate of 1.6/100,000 persons, with an average of 7 deaths reported each year. Most meningococcal disease in Washington is due to serogroup B.

Because of the potential for transmission of this serious infection, immediate public health action is required to identify and provide chemoprophylaxis for contacts of cases. Please call DOH Communicable Disease Epidemiology (877-539-4344) for specific recommendations.

Purpose of reporting and surveillance

- To identify contacts and recommend appropriate antibiotic prophylaxis.
- To educate exposed persons about signs and symptoms of disease, thereby facilitating early diagnosis.

Reporting requirements

- Health care providers: **immediately notifiable to Local Health Jurisdiction**
- Hospitals: **immediately notifiable to Local Health Jurisdiction**
- Laboratories: *Neisseria meningitidis* notifiable to Local Health Jurisdiction within 2 workdays; specimen submission required
- Local health jurisdictions: notifiable to DOH Communicable Disease Epidemiology within 7 days of case investigation completion or summary information required within 21 days

CASE DEFINITION FOR SURVEILLANCE

Clinical criteria for diagnosis

Meningococcal disease manifests most commonly as meningitis and/or meningococcemia that may progress rapidly to purpura fulminans, shock, and death. However, other manifestations might be observed.

Laboratory criteria for diagnosis

- Isolation of *Neisseria meningitidis* from a normally sterile site (e.g., blood or cerebrospinal fluid [CSF] or, less commonly, joint, pleural, or pericardial fluid).
  Positive antigen test results from urine or serum samples are unreliable for diagnosing meningococcal disease.

Case definition

- Probable: a case with a positive antigen test in CSF or clinical purpura fulminans in the absence of a positive sterile site culture.
- Confirmed: a clinically compatible case that is laboratory confirmed.

MENINGOCOCCAL MENINGITIS

A. DESCRIPTION

1. Identification

An acute bacterial disease, characterized by sudden onset of fever, intense headache, nausea and often vomiting, stiff neck and, frequently, a petechial rash with pink macules or, very rarely, vesicles. Delirium and coma often appear; occasional fulminant cases exhibit sudden prostration, ecchymoses and shock at onset. Formerly, case-fatality rates exceeded 50%, but with early diagnosis, modern therapy and supportive measures, the case-fatality rate is between 5% and 15%.

Up to 5%-10% of populations in countries with endemic disease may be asymptomatic carriers with the nasopharynx colonized with *Neisseria meningitidis*. A small minority of persons who become colonized will progress to invasive disease, characterized by one or more clinical syndromes including bacteremia, sepsis, meningitis or pneumonia. Many patients with sepsis develop a petechial rash, sometimes with joint involvement. Meningococcemia may occur without extension to the meninges and should be suspected in cases of unexplained acute febrile illness associated with petechial rash and leukocytosis. In fulminating meningococcemia, the death rate remains high despite prompt antibacterial treatment.

Diagnosis is confirmed by the recovery of meningococci from the CSF or blood. In culture negative cases, the diagnosis may be supported by identification of group specific meningococcal polysaccharides in CSF by LA, CIE and coagglutination techniques, or meningococcal DNA in CSF or plasma by PCR. Microscopic examination of Gram-stained smears from petechiae may reveal organisms.

2. Infectious Agent

N. meningitidis, the meningococcus. Group A organisms have caused the major epidemics in the US (none since 1945) and elsewhere; groups B, C and Y are, as of the late 1990s, responsible for most cases in the US. Certain genotypes have been associated with outbreaks of disease. Additional serogroups have been recognized as pathogens (e.g., groups W-135, X and Z). Organisms belonging to some of these serogroups may be less virulent, but fatal infections and secondary cases have occurred with all. Outbreaks of *N. meningitidis* are usually caused by closely related strains. Subtyping of isolates by use of methods such as multilocus enzyme electrophoresis or pulsed-field gel electrophoresis of

enzyme-restricted DNA fragments, may allow identification of an outbreak strain and aid in better defining the extent of an outbreak.

3. Worldwide Occurrence

Meningococcal infections are ubiquitous, but the incidence of meningococcal disease peaks in late winter to early spring. Meningococcal disease, while primarily a disease of very small children, occurs commonly in children and young adults; in many countries in males more than females, and more commonly among newly aggregated adults under crowded living conditions such as in barracks and institutions. An area of high incidence has existed for many years in the sub-Saharan region of mid-Africa, where the disease is usually caused by group A organisms. In 1996, the largest recorded epidemic of meningococcal disease occurred in west Africa, with close to 150,000 cases reported in Burkina Faso, Chad, Mali, Niger and Nigeria. Over the past 10 years, there have also been group A epidemics in Nepal and India, as well as in Ethiopia, Sudan and other African countries. During the 1980s and 1990s, group B has emerged as the most common cause of disease in Europe and most of the Americas. Epidemics, characterized by a 5-10 fold increase in incidence have been reported from many countries in Europe, Central and South America and most recently in New Zealand and the US Pacific northwest. Community outbreaks of group C disease have been observed with increasing frequency in the US and Canada since 1990. These outbreaks have particularly affected school and college aged persons, and transmission has occasionally occurred among persons congregating in bars or nightclubs. During the late 1990s, group Y disease has become as common as groups B and C in many parts of the US. Circulation of new strains of meningococci is usually characterized by an increase in the average age of persons reported with meningococcal disease.

4. Reservoir

Humans.

5. Mode of Transmission

By direct contact, including respiratory droplets from nose and throat of infected people; infection usually causes only a subclinical mucosal infection; invasion sufficient to cause systemic disease is comparatively rare. Carrier prevalence of 25% or greater may exist without cases of meningitis. During epidemics, over half the men in a military unit may be healthy carriers of pathogenic meningococci. Fomite transmission is insignificant.

6. Incubation period

Varies from 2 to 10 days, commonly 3-4 days.

7. Period of communicability

Until meningococci are no longer present in discharges from nose and mouth. Meningococci usually disappear from the nasopharynx within 24 hours after institution of treatment with antimicrobial agents to which the organisms are sensitive and which attain substantial concentrations in oropharyngeal secretions. Penicillin will temporarily suppress the organisms, but it does not usually eradicate them from the oronasopharynx.

8. Susceptibility and resistance

Susceptibility to the clinical disease is low and decreases with age; a high ratio of carriers to cases prevails. Those who are deficient in certain complement components are especially prone to recurrent disease. Splenectomized persons are susceptible to bacteremic illness. Group specific immunity of unknown duration follows even subclinical infections.

B. METHODS OF CONTROL

1. Preventive measures:

a. Educate the public on the need to reduce direct contact and exposure to droplet infection.
b. Reduce overcrowding in living quarters and workplaces, such as barracks, schools, camps and ships.
c. Vaccines containing groups A, C, Y and W-135 meningococcal polysaccharides have been licensed in the US and other countries for use in adults and older children; currently only the quadrivalent vaccine is available in the US. Meningococcal vaccine is effective in adults and has been given to military recruits in the US since 1971; it has also been used to control community and college outbreaks of group C disease during the 1990s. It should be given to certain high risk groups over 2 years of age who are especially susceptible to serious meningococcal infections, including asplenic patients, persons with terminal complement deficiencies and laboratory personnel who are exposed routinely to *N. meningitidis* in solutions that may be aerosolized. Recent studies have also shown that freshman college students in congregate settings appear to be at greater risk of meningococcal disease than the general public – it is now recommended by the ACIP and American College Health Association that individuals in that group consider meningococcal vaccination. Unfortunately, the C component is poorly immunogenic and ineffective in children under 2 years of age. Serogroup A vaccine is probably effective in younger children; however, for those 3 months to 2 years of age, 2 doses are given 3 months apart instead of the single dose given to those over 2 years of age. The duration of protection is limited, particularly in children less than 5 years of age. Routine immunization of civilians in the US is not recommended. Immunization will reduce the risk to travelers who plan to have prolonged contact with the local populace in countries experiencing epidemic meningococcal group A

or C disease. Reimmunization may be considered within 3-5 years if indications for receipt of vaccine still exist. No vaccine effective against group B meningococci is currently licensed in the US, although several have been developed and demonstrated to have some efficacy in older children and adults. Conjugate vaccines against serogroups A and C are in clinical trials, but their efficacy, as of late 1999, has not been evaluated. For infants and young children, conjugate serogroup A, C, Y, and W135 meningococcal vaccines have been developed through methods similar to those used for *Haemophilus influenzae* type b conjugate vaccines. These vaccines are expected to be used routinely in the United Kingdom starting around the year 2000 and should become available in the US within 2-4 years thereafter.

2. Control of patient, contacts and the immediate environment:

a. Report to local health authority.
b. Isolation: Respiratory isolation for 24 hours after start of chemotherapy.
c. Concurrent disinfection: Of discharges from the nose and throat and articles soiled therewith. Terminal cleaning.
d. Quarantine: None.
e. Protection of contacts: Close surveillance of household, daycare, and other intimate contacts for early signs of illness, especially fever, to initiate appropriate therapy without delay; prophylactic administration of an effective chemotherapeutic agent to those who had intimate contact with the case in the 7 days before onset (household contacts, military personnel sharing the same sleeping space and people socially close enough to have shared eating utensils, e.g., close friends at school but not the whole class). Younger children in day care centers are exceptions and, even if not close friends, all should be given prophylaxis after an index case is identified. Prophylaxis is not routinely recommended for health care workers unless they have had intimate exposure, such as performing unprotected mouth-to-mouth resuscitation, intubation, or suctioning of a case who has received <24 hours of appropriate antibiotic therapy. Prophylaxis is best when given within 24 hours of diagnosis of the index case, and is unlikely to be effective if given more than 14 days following exposure. The prophylactic antibiotic agent of choice is rifampin administered twice daily for 2 days: adults 600 mg per dose; children over 1 month old, 10 mg/kg; and for those less than 1 month old, 5 mg/kg. Rifampin should be avoided by pregnant women. Rifampin may reduce the effectiveness of oral contraceptives.

   For adults, ceftriaxone, 250 mg IM, given in a single dose, is effective; 125 mg IM for children under 15 years of age. Ciprofloxacin, 500 mg PO, may be given as a single dose to adults. If the organisms have been shown to be sensitive to sulfadiazine, it may be given to adults and older children at a dosage of 1.0 g every 12 hours for 4 doses; for infants and children, the dosage is 125-150 mg/kg/day divided into 4 equal doses, on each of 2 consecutive days. As of 1993, sulfadiazine is no longer manufactured in the US, and assistance may be needed from CDC to obtain this drug. Health care personnel are rarely at risk even when caring for infected patients; only intimate exposure to nasopharyngeal secretions (e.g., as in

mouth to mouth resuscitation) warrants prophylaxis. There would be insufficient time for immunization of close household contacts to be of any value.

f. Investigation of contacts and source of infection: Throat or nasopharyngeal cultures are of no value in deciding who should receive prophylaxis since carriage is variable and there is no consistent relationship between that found in the normal population and in an epidemic.
g. Specific treatment: Penicillin given parenterally in adequate doses is the drug of choice for proven meningococcal disease; ampicillin and chloramphenicol are also effective. However, strains resistant to penicillin have been reported in multiple countries, including Spain, England and the US; strains resistant to chloramphenicol have been reported in Vietnam and France. Treatment should begin immediately when the presumptive clinical diagnosis is made, even before meningococci have been identified. In children, until the specific etiologic agent has been identified, the therapy must be effective against *Haemophilus influenzae* type b (Hib) as well as *Streptococcus pneumoniae*. While ampicillin is the drug of choice for both as long as the organisms are ampicillin sensitive, it should be combined with a third generation cephalosporin, or chloramphenicol or vancomycin should be substituted in the many places where ampicillin resistant *H. influenzae* b or penicillin- resistant *S. pneumoniae* strains are known to occur. Patients with meningococcal or Hib disease should be given rifampin prior to discharge from the hospital if neither a third generation cephalosporin nor ciprofloxacin was given as treatment to ensure elimination of the organism.

3. Epidemic measures

a. When an outbreak occurs, major emphasis must be placed on careful surveillance, early diagnosis and immediate treatment of suspected cases. A high index of suspicion is invaluable.
b. Separate individuals, and ventilate living and sleeping quarters of all people who are exposed to infection because of crowding or congested living conditions (e.g., soldiers, miners and prisoners).
c. Mass chemoprophylaxis is usually not effective in controlling outbreaks. However, in outbreaks involving small populations (e.g., a single school), administration of chemoprophylaxis to all persons within the population may be considered, especially if the outbreak is caused by a serogroup not included in the available vaccine. If undertaken, it should be administered to all members of the community at the same time. All intimate contacts should still be considered for prophylaxis, regardless of whether the entire small population is treated (see B2e, above).
d. The use of vaccine in all age groups affected should be strongly considered if an outbreak occurs in a large institutional or community setting in which the cases are due to groups A, C, W-135 or Y (see B1c, above). Meningococcal vaccine has been very effective in halting epidemics due to A and C serogroups. The following may help in deciding whether to immunize persons at risk during possible group C outbreaks: a) determine the epidemiology of the outbreak to find the least common age and social denominator (e.g., a school, day care setting, organization, night club, town) among affected persons; b) calculate attack rates with the outbreak

strain among the population at risk; and c) subtype *N. meningitidis* isolates, if available, from cases of disease, using molecular typing methods. If at least 3 cases of group C disease with the same subtype have occurred during a 3 month period, new cases are still occurring and the attack rate exceeds 10 group C cases per 100,000 in the population at risk, then immunization of those in the group at risk should be considered.

4. International measures

WHO Collaborating Centres. While not covered by International Health Regulations, a valid certificate of immunization against meningococcal meningitis may be required by some countries, as by Saudi Arabia for religious visitors.